# Section 12 Sevier River Basin
# WATER QUALITY



Tables



Figures

# Water Quality

**Good quality water is an indicator of a healthy, well-managed environment.**

## 12.1 INTRODUCTION

Utah was introduced to maintaining high quality water resources with introduction of the Utah Water Pollution Control Act of 1953. This was reinforced by the Federal Water Pollution Control Act of 1972.. In 1984, the governor of Utah issued an executive order to prepare and implement a groundwater protection plan. It is evident water quality is an important aspect of our lives. This section describes the existing levels of water pollution in the Sevier River Basin. Sources of pollution are identified, problems and solutions are discussed and recommendations are given for water quality management and improvement.

## 12.2 SETTING

The highest water quality is found in the upper reaches of the Sevier River, its tributaries and the streams flowing into Pahvant Valley. As the water flows downstream, the quality deteriorates.

The Division of Water Quality is currently conducting surface- water quality studies and the results will be published in 1999. Selected parts of this plan will be included in the report by the Division of Water Quality.

The U.S. Geological Survey, in cooperation with the Division of Water Rights, has conducted groundwater studies throughout the Sevier River Basin (See Section B, Bibliography). One series were water supply papers published during the 1960s and early 1970s. The latest series of technical publications were published during the 1980s and 1990s. Both surface and groundwater quality measurements were taken during the course of these studies. The results are summarized in this section and Section 19, Groundwater. The water quality measurement units are shown in this section as mg/L (milligrams per liter) while those reported in the original document, if different, follow in parenthesis. See Section A, Acronyms, Abbreviations and Definitions for a definition of water quality terms.

Surface water quality measurements were taken in the Upper Panguitch Valley area during 1988-89.[60] The following is the average of the measurements of total dissolved-solids (specific conductance) collected: Sevier River near Hatch, 190 mg/L (322 µS/cm); Sevier River above McEwen Diversion, 310 mg/L (525 µS/cm); Sevier River near Circleville, 285 mg/L (480 µS/cm); East Fork Sevier River below Deer Creek, 305 mg/L (520 µS/cm); and East Fork Sevier River near Kingston, 255 mg/L (430 @/cm).

Surface water quality data were collected in the Central Sevier Valley area in August and October 1988.[39] The averages of the measurements of total dissolved-solids (specific conductance) were: Sevier River above Clear Creek, 283 mg/L (480 µS/cm); Sevier River east of Richfield, 552 mg/L (935 µS/cm);and Sevier River at Sigurd, 590 mg/L (1,000 µS/cm). Samples taken in the northern Sevier Valley during August 1988 showed total dissolved- solids for the Sevier River west of Salina, 915 mg/L (1,550 µS/cm); Sevier River south of Redmond, 1,040 mg/L (1,763 µS/cm); and Sevier River below San Pitch River, 1,103 mg/L (1,870 µS/cm). Except for Clear Creek, the dissolved-solids concentrations of inflows to the river were higher than those of the river itself.

During studies carried out by the U.S. Geological Survey[76] in Sanpete Valley during the years 1988-89, the following surface water quality data were collected: San Pitch River below Milbum, 448 mg/L (760 µS/cm); San Pitch River west of Chester, 767 mg/L (1,300 µS/cm); San Pitch River near Manti, 1,100 mg/L (1,865 µS/cm); and San Pitch River below Gunnison Reservoir, 920 mg/L (1,560 µS/cm). The latter reading reflects the inflow from Six Mile Creek into Gunnison Reservoir.

Surface water quality data collected on Chicken Creek during September 1992 indicate increases in chemical constituents as the water moves downstream.[55] Sample analyses indicate the following: Chicken Creek about 3 miles above Levan, 263 mg/L (445 µS/cm) and Chicken Creek near Levan, 545 mg/L (925 µS/cm). A sample in November 1993 at Chicken Creek Reservoir outlet showed 780 mg/L (1,320 µS/cm).

Water quality data were collected on the lower Sevier River during the 1980s. These data show water quality near Lynndyl averaged 1,162 mg/L (1,970 @/cm) with an average of 442 cfs during May and June 1982. In 1988, the water quality was 1,025 mg/L (1,737 µS/cm) with a flow of 28 1 cfs and 2,340 mg/L (3,966 µS/cm) with a flow of 29 cfs.

Data on the lower Sevier River were also collected in May 1964.[32] These surface water quality data, given as total dissolved-solids (TDS), for selected locations are: Sevier River near Juab, 1,560 mg/L; Sevier River near Lynndyl, 1,540 mg/L; Canal A at DMAD Reservoir, 1,230 mg/L; Sevier River below Gunnison Bend Reservoir, 1,150 mg/L; and Sevier River near Hinckley, 2,730 mg/L.

The U.S. Geological Survey took water samples in 1985 as part of a study of the Pahvant Valley.[58] The surface water quality was as follows: Chalk Creek (upper), 240 mg/L (410 µS/cm); Chalk Creek (lower), 435 mg/L (740 µS/cm); Meadow Creek, 275 mg/L (470 µS/cm); and Corn Creek, 395 mg/L (670 µS/cm).

Similar data taken during the 1960s showed the total dissolved solids for Chalk Creek near Fillmore, 180 mg/L and for Corn Creek near Kanosh, 234 mg/L.[43] This indicates the water quality is deteriorating.

These data clearly show the deterioration of water quality as the Sevier River flows from the upper reaches in Panguitch Valley until it enters the Delta area. Many of the contaminants are the result of deep percolation and return flows from irrigation where salts are leached from the soil profiles. There is considerable contamination from leaching of salts found in the Arapien shale formation which is at or near the surface in the Central Sevier Valley, along the western part of Sanpete Valley, and in southern Juab Valley. This formation is the source of supply for the rock salt mines near Redmond.

Figures 12-1 through 12-5 show the total dissolved-solids (TDS) and specific conductance for selected stations along the Sevier River for the period 1971-91. Figure 12-6 shows the station near Lynndyl for the period 195 1-9 1. The stations in the upper Sevier River show a constant or slight increase in contaminants. Stations in the lower Sevier River show a decrease in contaminants. It is possible this may reflect a change in irrigation management practices in the upper Sevier River or a change in the volume of flows or a combination of both.

Additional information on groundwater quality can be found in Section 19, Groundwater.

## 12.3 ORGANIZATIONS AND REGULATIONS

Water quality is important to all users. Leadership in maintaining water quality rests with local governments along with assistance from state and federal regulatory agencies and programs.

### 12.3.1 Local

The Central Utah District Public Health and the Southwest Utah District Public Health departments are involved in water quality matters in the Sevier River Basin. The Six-County Association of Governments and the Panoramaland Resource Conservation and Development Council are currently participating with the Division of Water Quality in a study of the Sevier River Basin. The area in Garfield County is included through a cooperative agreement with Color County Resource Conservation and Development Council. This study will provide water quality data along with information on improvement and management.

City, town and county governments have the responsibility to follow and enforce state laws and regulations in operation of their facilities. They take an active role in protecting wells, springs,

Figure 12-l
SURFACE WATER QUALITY - SEVIER RIVER AT HATCH
Sevier River Basin

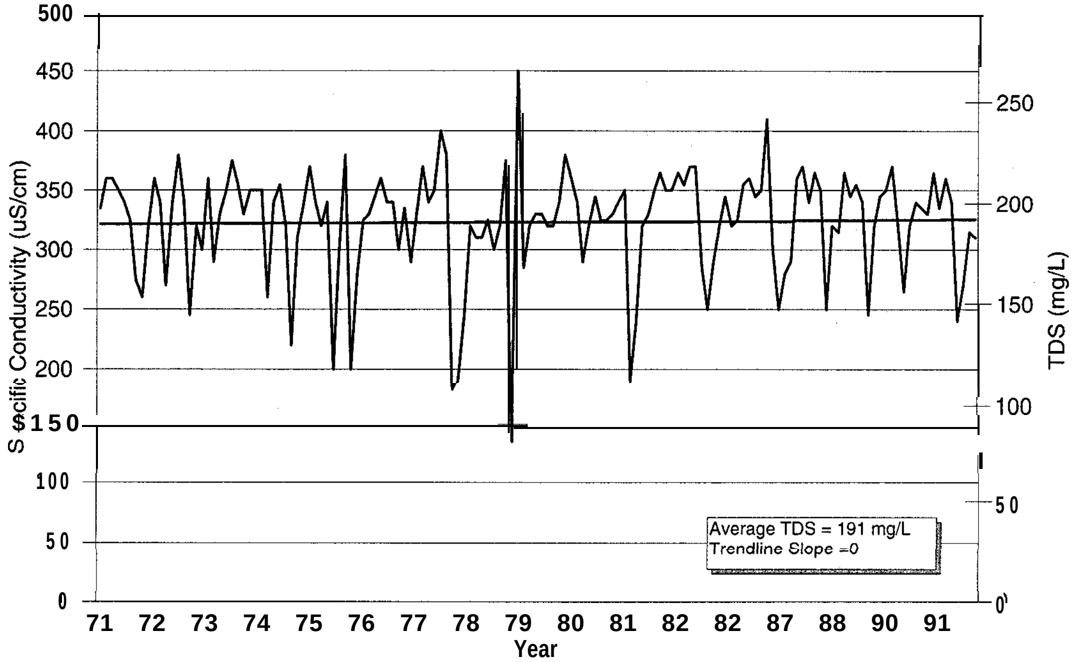



Figure 12-2
SURFACE WATER QUALITY - EAST FORK SEVIER RIVER NEAR KINGSTON
Sevier River Basin

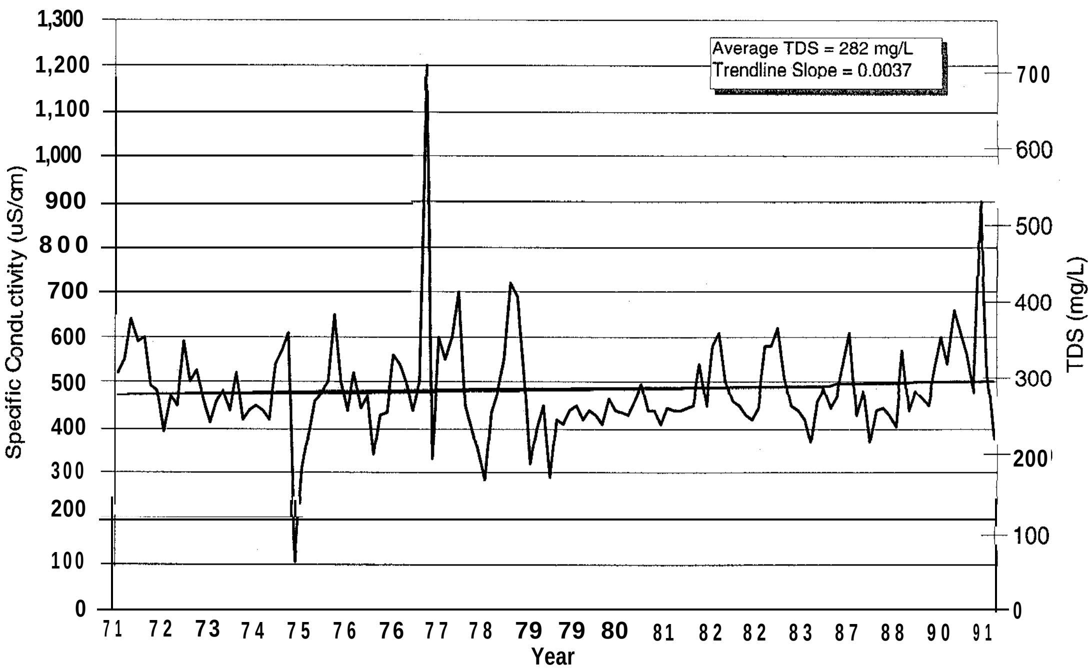


Figure 12-3
**SURFACE WATER QUALITY - SEVIER RIVER ABOVE CLEAR CREEK**
Sevier River Basin

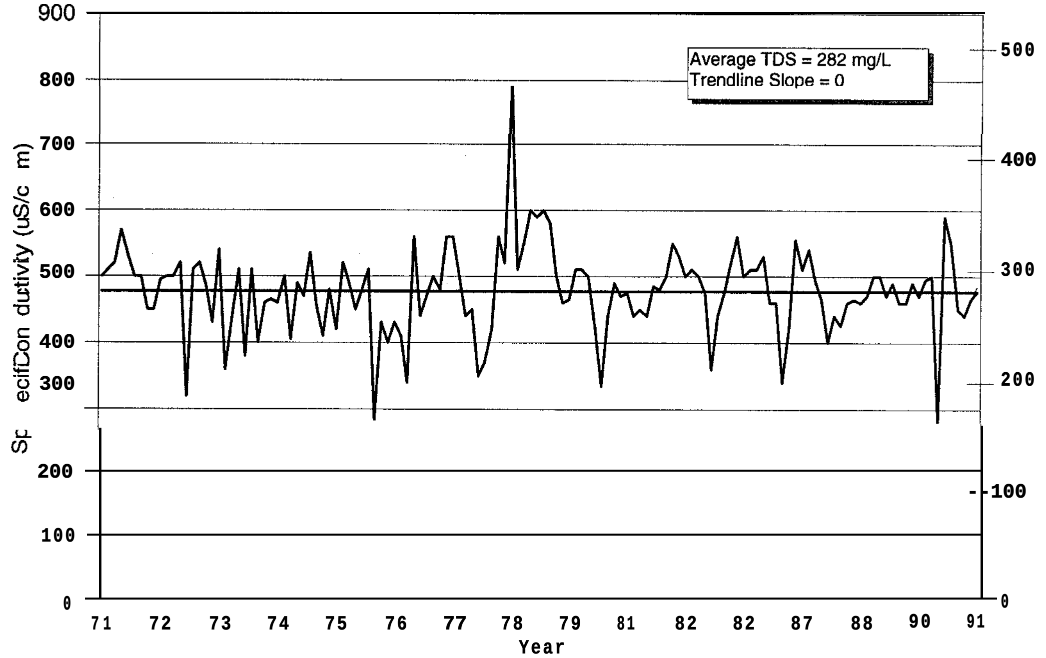



Figure 12-4
**SURFACE WATER QUALITY - SEVIER RIVER BELOW SAN PITCH RIVER**
Sevier River Basin

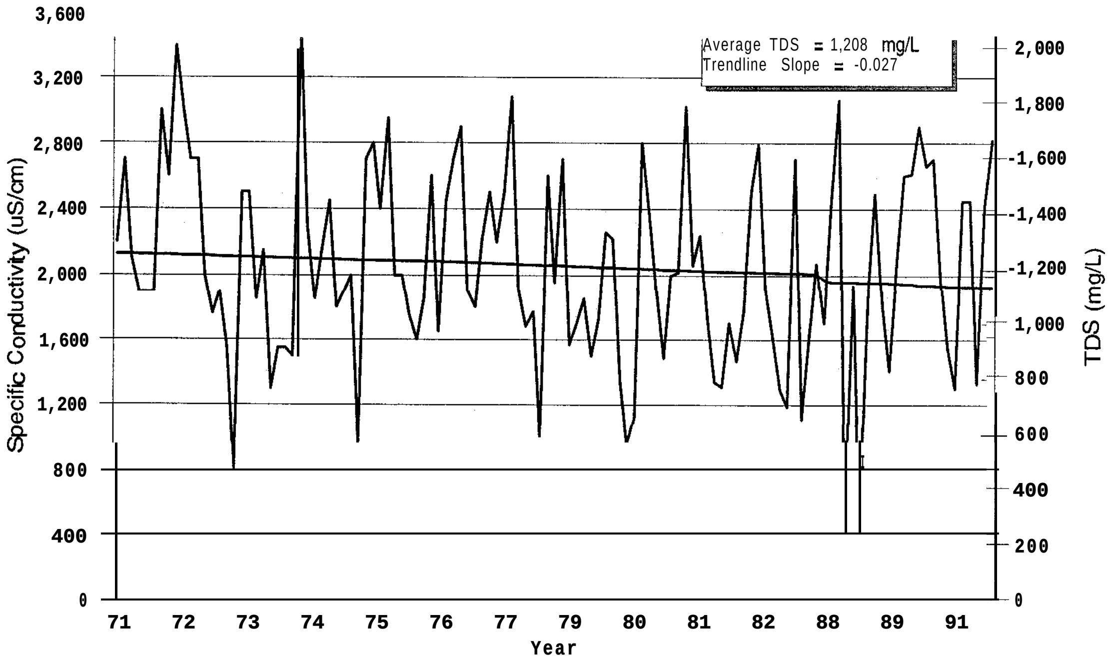


Figure 12-5
**SURFACE WATER QUALITY - SEVIER RIVER NEAR JUAB**
Sevier River Basin

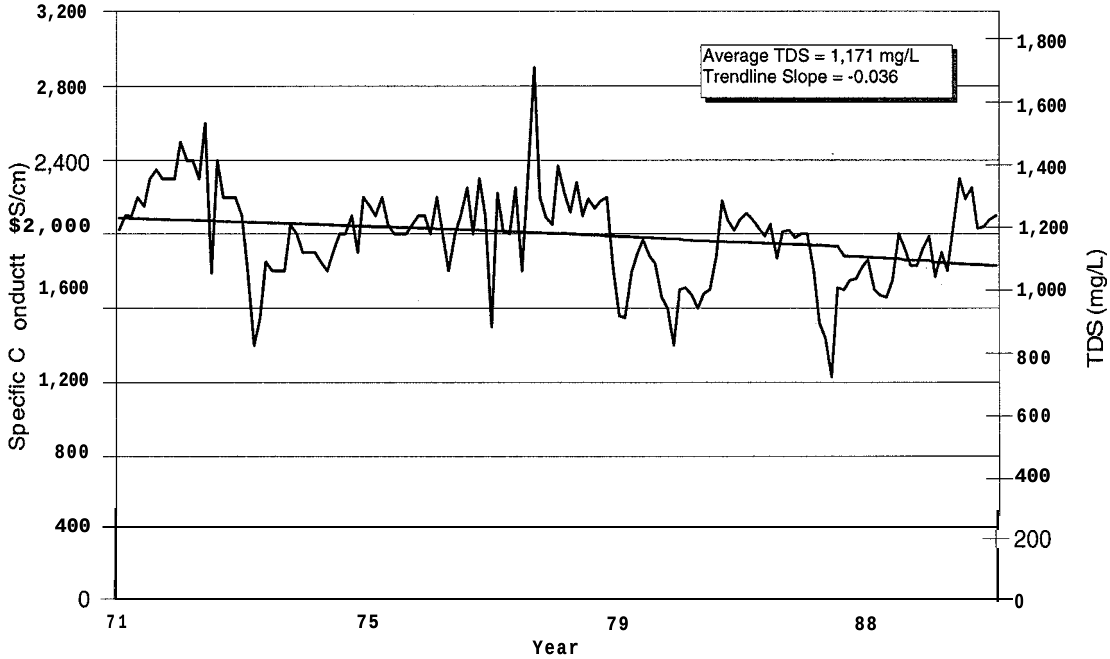
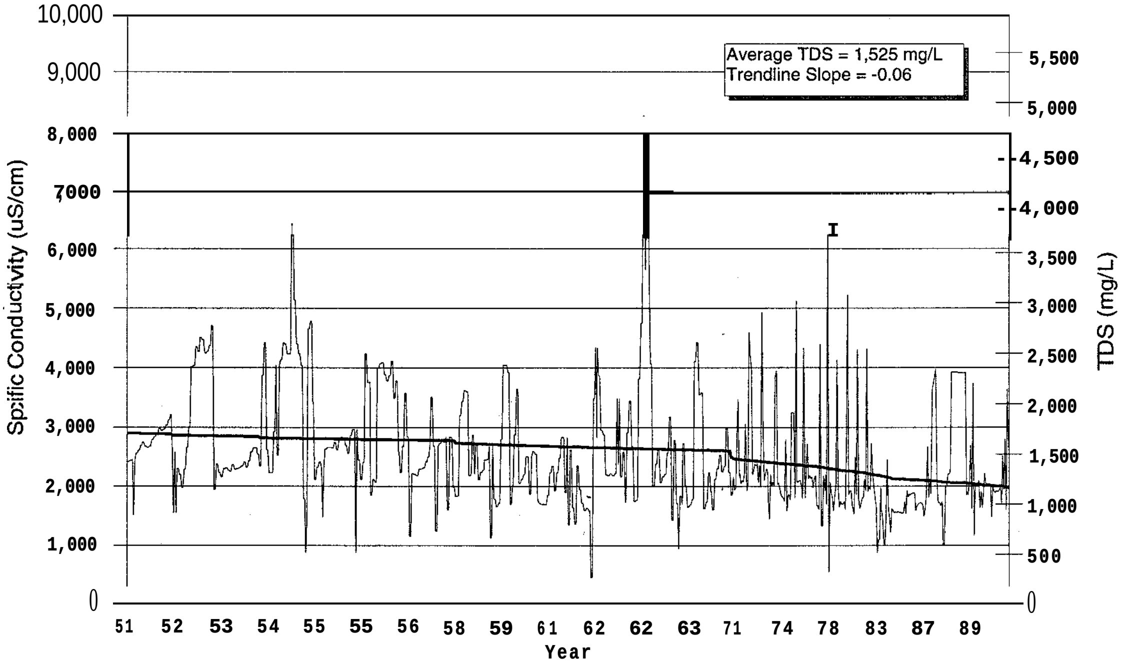



Figure 12-6
**SURFACE WATER QUALITY - SEVIER RIVER NEAR LYNNDYL**
Sevier River Basin



and recharge areas, and in treating waste water. Table 12-1 shows the community wastewater treatment facilities.

### 12.3.2 State

The Division of Water Quality (DWQ) is responsible for adopting, enforcing and administering state and federal water quality regulations. This includes the Utah Water Quality Act and the federal Clean Water Act. They are charged to maintain acceptable levels of water quality for a growing population. Increasing numbers of people also bring more recreational activity with added potential for pollution of surface steams and reservoirs as well as groundwater. This will require water quality agencies and water rights administrators to correlate their activities to assure state surface water and groundwater standards are met.

The Clean Water Act gives responsibility to the Department of Environmental Quality for the enforcement of regulations dealing with point and nonpoint source discharges. The Division of Water Quality is responsible for administration of the National Pollutant Discharge Elimination Systems (NPDES). They are also responsible for implementing the Nonpoint Source (NPS) Program. The agricultural portion of the NPS program is carried out by the Utah Department of Agriculture and Food under contract with the Department of Environmental Quality.

Limits on loading rates or discharge of various pollutants are established by the state as part of the discharge permits with consideration given to Environmental Protection Agency (EPA) 5guidelines. Municipal wastewater treatment facilities and industries discharging pollutants into Utah waters are issued a Utah Pollutant Discharge Elimination System (UPDES) permit, These permits are valid for five years and must be renewed with a reevaluation of pollutant limitations.

Enforcement of NPDESAJPDES permit requirements is accomplished by effluent monitoring programs supervised by DWQ. Currently, three municipal wastewater facilities and seven industrial waste water facilities have discharge permits. See Table 12-2 for a list of permitees.

Most of the communities use septic tanks to dispose of wastes. This is becoming a problem in some areas because of pollution buildup where septic tanks are more concentrated. Communities with septic tanks for waste disposal are shown in Table 12-3.

The Division of Water Quality developed a "Ground Water Quality Protection Strategy" for the state of Utah based on an executive order by the governor in 1984. Groundwater discharge permits are required for activities with the potential for pollution. The DWQ has also established classifications for surface water in Utah based on beneficial uses. To help control water quality, the streams, reservoirs and lakes are assigned standards for maximum contaminant levels according to four major beneficial use designations. These uses are; 1) As a source for drinking water, 2) for swimming and indirect contact recreation, 3) stream/lake/wetland dependent fish and wildlife, and 4) agriculture. Table 12-4 shows the current beneficial use water quality classes and other pertinent information for the water storage facilities. Table 12-5 shows the use classification of streams.

Clean Lakes Projects are in various stages of implementation by the Division of Water Quality (DWQ). Phase I Clean Lakes Program studies have been implemented for Navajo Lake and

Cattle along Otter Creek

Table 12-1
COMMUNITY WASTEWATER TREATMENT FACILITIES

| County/Facility | Disposal Method | Capacity | Receiving Point Discharge |
|---|---|---|---|
| **Garfield** | | | |
| Panguitch | Sewage Lagoons | N A | N A |
| **Juab** | | | |
| Eureka | Aerated Lagoon | N A | N A |
| **Millard** | | | |
| Brush Wellman | | | |
| Delta | Total Containment Lagoon | N A | NA |
| Fillmore | Total Containment Lagoon | N A | N A |
| Hinckley | Total Containment Lagoon | N A | N A |
| IPP | Total Containment Lagoon w/Aeration | N A | N A |
| **Sanpete** | | | |
| Centerfield | Collection System-Evaporation Ponds | | N A |
| Ephraim [a] | Total Containment Lagoon | | NA |
| Fountain Green [b] | Total Containment Lagoon | | N A |
| Gunnison | Total Containment Lagoon | | N A |
| Manti [c] | Total Containment Lagoon | | N A |
| Moroni | Activated Sludge | 1.1 mg x daily flow [e] | **0.6** mgd |
| Mt. Pleasant [d] | Total Containment Lagoon | N.A | N A |
| Spring City | Lagoon | **20** acres [f] | 60 gpm |
| **Sevier** | | | |
| Aurora | Total Containment Lagoon | N A | N A |
| Redmond | Total Containment Lagoon | N A | N A |
| Richfield | Total Containment Lagoon | N.A | N A |
| Salina | Intermittent Discharge Lagoon | **98** acres [f] | **0.57** mgd |
| Total | | | |

[a] 20 homes use septic tanks
[b] 3 homes use septic tanks
[c] 20 percent use septic tanks
[d] 10 percent use septic tanks
[e] Design capacity
[f] Surface area

Source: Division of Water Quality

| Table 12-2<br>POINT SOURCE DISCHARGE PERMITS | |
|---|---|
| Permitee | Receiving Water |
| Eureka Lagoons | Eureka Lagoons |
| Moroni WWTP | San Pitch River |
| Road Creek FH-Burrville | Burr Creek |
| Road Creek FH-Deans #1 | Piped to #2 |
| Road Creek FH-#2 | Canal, ditches to Otter Creek |
| Spring City Lagoons | Unnamed Streams |
| Trophy FH | Cove River Canal |
| UDWR FH-Fountain Green | Silver Creek |
| UDWR FH-Glenwood | Glenwood Spring Creek |
| UDWR FH-Mammoth | Mammoth Creek |

Otter Creek Reservoir. Phase I and II studies have been completed for Panguitch Lake.

The Utah Department of Agriculture and Food, Environmental Quality Section, carries out the agricultural portion of the nonpoint water pollution control and prevention program administered by the Department of Environmental Quality/Division of Water Quality. This program is funded by EPA grants and matching funds from state and local agencies and private sources. The program includes watershed management projects, groundwater monitoring, and information and education. Public information programs include newsletters, brochures, videos and slide shows. These are also extended to public schools and adult education.

### 12.3.3 Federal

Congress passed the federal Water Pollution Control Act in 1972 to establish regulatory programs to improve the quality of the nation's waters. In 1977, the act was amended and became known as the Clean Water Act (CWA). Additional amendments were made in 1987.

The CWA amendments provided regulations to deal with the growing national toxic water pollution problem and to further refine the EPA's enforcement priorities. The amendments substantially increased EPA's authority to enforce all water quality regulations associated with new federal mandates to clean up the nation's streams, rivers, reservoirs and lakes.

In the mid-1950s, the federal government began offering funding programs to state water pollution control agencies to help in the ongoing construction of wastewater facilities. These early grants provided funding to pay for 30 to 55 percent of the total construction costs. This source of funds, along with monies provided through the Utah Water Pollution Control Act, helped finance most wastewater treatment facilities. More than $5.86 million in grants and loans were spent to construct or enlarge wastewater treatment and collection facilities in the Sevier River Basin.

Federal public works expenditures drastically decreased by 1990 and most grant programs for

Table 12-3
COMMUNITIES WITH SEPTIC TANKS

| County/Community | County/Community |
|---|---|
| **GARFIELD** | **SANPETE** |
| Antimony | Axtell |
| Hatch | Fairview |
| **JUAB** | Heartland Mobile Home Park |
| Levan | Mayfield |
| **MILLARD** | Sterling |
| Deseret-Oasis SS | Wales |
| Kanosh-Paiute Indian Reservation | **SEVIER** |
| Lynndyl | Annabella |
| Oak Meadows Subdivision | Austin Community SSD |
| Sherwood Water Company | Brooklyn Tapline Company |
| Holden | Central Valley |
| Kanosh | Cove SSD |
| Learnington | Elsinore Town |
| Meadow | Glenwood |
| Oak City | Joseph |
| Scipio | Koosharem |
| **PIUTE** | Monroe |
| Circleville | Shadow Mnt Estates Subdivision |
| Greenwich Waterworks Co | Sigurd |
| Kingston | South Monroe |
| Marysville | |

Source: Division of Water Quality and Division of Water Resources

Table 12-4
SURFACE STORAGE CLASSIFICATIONS

| Name | Capacity (acre-feet) | Beneficial Use Classes 2A | 2B | 3A | 3B | 4 | Trophic Status |
|---|---|---|---|---|---|---|---|
| Barney Lake | 200 | | x | x | | X | 60.70 |
| Big Lake | 1,115 | | x | x | | X | NA |
| DMAD | 10,990 | | X | | x | x | 60.55 |
| Fairview Lake #2 | 2,200 | | x | x | | X | 39.25 |
| Gunnison Bend | 5,000 | | X | | x | x | 55.04 |
| Gunnison | 20,264 | | X | | x | x | 56.81 |
| Koosharem | 7,470 | | x | x | | X | 65.86 |
| Lower Box Creek | 340 | | x | x | | X | 74.28 |
| Manning Meadow | 996 | | x | x | | X | 50.17 |
| Navajo Lake | 11,700 | | x | x | | X | 39.71 |
| Nine Mile | 3,500 | X | | X | | X | 53.10 |
| Otter Creek | 52,495 | | x | x | | X | 55.23 |
| Palisade Lake | 1,728 | x | x | | x | x | 39.61 |
| Panguitch Lake | 23,730 | | x | x | x | x | 52.67 |
| Pine Lake | 1,100 | | x | x | | X | 19.66 |
| Piute | 71,826 | | x | x | | X | 45.54 |
| Redmond Lake | 1,200 | | X | | x | x | 70.71 |
| Rex | 975 | | x | x | | X | 50.21 |
| Sevier Bridge | 236,145 | | X | | x | x | 52.19 |
| Tropic | 3,600 | | x | x | | X | 39.12 |

Trophic Status Index (TSI)[37] refers to the nutrient status, biological production and morphological characteristics of the water. TSI less than 40 = Oligotrophic, TSI 40 to 50 = Mesotrophic, TSI over 50 = Eutrophic.
The lower the index number, the better the water.
Note: See Table 12-4 for beneficial use class definitions.
Source: Division of Water Quality.

Table 12-5
STREAM CLASSIFICATIONS

| Stream | Use Classifications | | | | |
|---|---|---|---|---|---|
| Sevier River and tributaries from Gunnison Bend Reservoir to Annabella Diversion except the following tributaries: | 2B | | 3B | | 4 |
| Oak Creek | 2B | 3A | | | 4 |
| Round Valley Creek & tributaries | 2B | 3A | | | 4 |
| Chicken Creek | 2B | 3A | | | 4 |
| San Pitch River & tributaries from confluence with Sevier River to U-132 crossing except the following tributaries: | 2B | | 3C | 3D | 4 |
| Twelve Mile Cr & trib from USFS bdy to hdwtr | 2B | 3A | | | 4 |
| Six Mile Creek & tributaries | 2B | 3A | | | 4 |
| Manti Creek & tributaries | 2B | 3A | | | 4 |
| Ephraim Creek & tributaries | 2B | 3A | | | 4 |
| Oak Creek & trib from USFS bdy to hdwtr | 2B | 3A | | | 4 |
| Fountain Green & trib fr USFS bdy to hdwtr | 2B | 3A | | | 4 |
| San Pitch R & trib from U-132 cross to hdwtr | 2B | 3A | | | 4 |
| Sevier River and tributaries from Annabella Diversion to headwaters | 2B | 3A | | | 4 |
| Monroe Creek and tributaries | 2B | 3A | | | 4 |

Class 1 Culinary raw water source
Class 1C Domestic use with prior treatment
Class 2 Instream recreational use and aesthetics
Class 2A Primary human contact-swimming
Class 2B Secondary human contact-boating, wading etc.
Class 3 Instream use by aquatic wildlife
Class 3A Habitat maintenance for cold water game fish, water related wildlife and food chain organisms
Class 3B Habitat maintenance for warm water game fish, water related wildlife and food chain organisms.
Class 3C Habitat for non game, water related wildlife and food chain organism.
Class 3D Habitat for water fowl, shore birds, water related wildlife, and food chain organisms.
Class 4 Agricultural-livestock and irrigation water.
Class 5 Great Salt Lake general use-primary and secondary human contact, water related wildlife, and mineral extract.
Class 6 General use restricted and/or governed by environmental and health standards and limitations.
Source: Division of Water Quality.

construction and upgrades were eliminated. Today, federal wastewater treatment funding is only available through revolving loan programs administered by the Division of Water Quality. Total expenditures are over $21.29 million for wastewater assistance in the Sevier River Basin.

Federal standards for solid waste and hazardous material are set forth under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), often called the Super Fund. These standards are regulated by EPA. Local health department monitoring programs are also used to verify compliance. In addition, the Corps of Engineers is involved in water quality issues.

## 12.4 WATER QUALITY PROBLEMS

Water quality problems can be caused by one or more of several sources. These are described below.

Pollution from natural geologic sources is almost impossible to control. This was highlighted by a letter to the editor from a New York City woman who thought all the erosion at Bryce Canyon was awful and something should be done to stop it. Geologic pollution becomes more evident as the high quality of water from the upper watersheds deteriorates as it flows downstream.

Point sources of pollution are usually from municipal and industrial facilities. Table 12-2 lists the point sources where discharge permits have been issued and discharges are monitored by the Division of Water Quality.

Other sources of pollution include contaminants from man-caused nonpoint sources. Runoff from pastures, over-inigation of agricultural croplands and abuse of the upper watersheds pollute water supplies. There are concerns about contamination from sewer lagoons and concentrations of septic tanks in the valley areas (Table 12-3). Septic tanks in summer home concentrations are becoming a problem in upper watershed areas such as along the Wasatch Plateau and on Cedar and Monroe Mountains.

### 12.4.1 Surface Water Quality Problems

The surface water quality is excellent to good in the upper reaches of the Sevier River and its tributaries as indicated by samples taken during 1988-89. As the water moves downstream and is diverted and used, the quality deteriorates. The Sevier River contains dissolved-solids less than 300 mg/L until it reaches the Sevier Valley area. East of Richfield the water contains 552 mg/L (935 µS/cm)and at Sigurd it was 590 mg/L (1,000 µS/cm) in 1988. The total dissolved-solids (TDS) south of Redmond were 1,040 mg/L (1,763 µS/cm) and were 1,103 mg/L (1,870 µS/cm) below the confluence with the San Pitch River. The San Pitch River has only 1,050 mg/L (1,780 µS/cm) below Gunnison Reservoir although it reached 1,100 mg/L (1,865 µS/cm) west of Manti.

The water salinity increases as the Sevier River reaches areas where the Arapien shale influences the water quality. This geologic formation is high in salts which are readily leached as water moves over and through this formation. The Arapien shale is a large contributor of salts to the Sevier River system in central Sevier Valley and Sanpete Valley. Brine and Lost creeks contribute high concentrations of TDS although loadings are low because stream flows are small, generally less than 0.5 c.f.s.

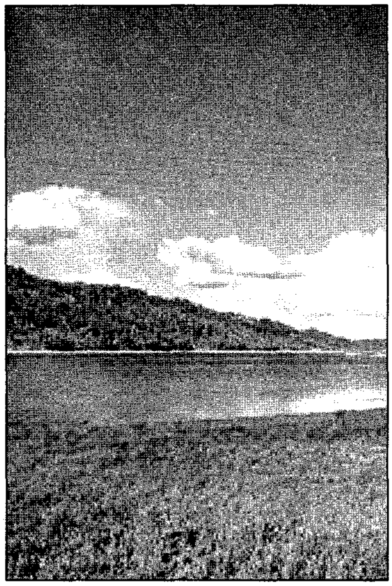
Chicken Creek flows are less than 1,000 mg/L where they enter Juab Lake. There are flows with high TDS but the flows are low, making the total loading small.

Water salinity measurements taken near Lynndyl in May and July 1982 averaged 1,162 mg/L (1,970 µS/cm) with flows averaging 442 cfs. Measurements at Hinckley in 1964 showed 2,730 mg/L. The water salinity in the lower reaches of the Sevier River reflects the accumulation of contaminants throughout the system.

The major water quality problems are the increases in total dissolved-solids as the water flows downstream. There are two main sources of pollutants. These are geologic and man-caused. The geologic will be difficult to control. It may be possible to modify or dilute the salt inputs at some locations. The man-caused problems are usually from irrigation water leaching into the groundwater reservoirs. This water moves

downstream and reappears as return flow. As a result, the water quality deteriorates in the downstream reaches. See Figure 12-7.
Water quality problems are described below for the Clean Lakes Projects. These projects are Navajo Lake, Otter Creek Reservoir and Panguitch Lake.

The water quality problem in **Navajo Lake** is caused by the growth of macrophytes (vegetative bodies) associated with the sediments.[37] This problem is increased by the penetration of light to the lake bottom. These large mats of organic material cause high pH values and reduce dissolved-oxygen resulting in anoxic or low oxygen conditions, especially during the winter months when ice covers the lake. Navajo Lake is considered oligotrophic. Concentrations of hydrogen sulfide also occur during the winter period as the macrophytes decompose. There is at least a partial fish-kill every year. Pollution is produced by livestock grazing and by wastes and litter from recreation activities.


Navajo Lake

Phosphorus concentrations have been a problem in **Otter Creek Reservoir** although there has been a decline in recent years.[37] Also, high algae production and macrophytes have caused excessive pH values. The reservoir was eutrophic with atrophic status index (TSI) over 50 but has recently been classed as mesotrophic (TSI 40-50). The high level of nutrients has produced large blue-green algal blooms along with macrophytes. Also, low dissolved-oxygen levels develop when the organic materials decompose. The extensive production of the macrophytes restricts boating and impairs the fishery. Nonpoint sources of pollution include sedimentation and nutrient loading from grazing, pesticides and fertilizers from cropland and wastes/litter from recreation.

Both total phosphorus and dissolved oxygen in **Panguitch Lake** have exceeded state water quality standards.[37] As a result, it is considered eutrophic and nitrogen limited. Historically, there have been blue-green algal blooms and summer oxygen deficits in the reservoir bottom waters which have contributed to some fish kills although none have occurred recently. These problems are caused by litter and human wastes from recreation and by increased sedimentation from over-grazing and denuding the soil through timber harvesting and wildfires.

### 12.4.2 Groundwater Problems

The groundwater reservoirs are a vital part of the Sevier River system. This is a large resource that once contaminated, is extremely difficult if not impossible to reclaim. With this in mind, it would seem important to install a groundwater quality monitoring network to detect any changes caused by outside sources.

Many potential sources of groundwater pollution exist. These include contaminants from agricultural operations, various types and methods of waste disposal, toxic spills, leaking underground tanks and operations such as mining, and oil and gas exploration.

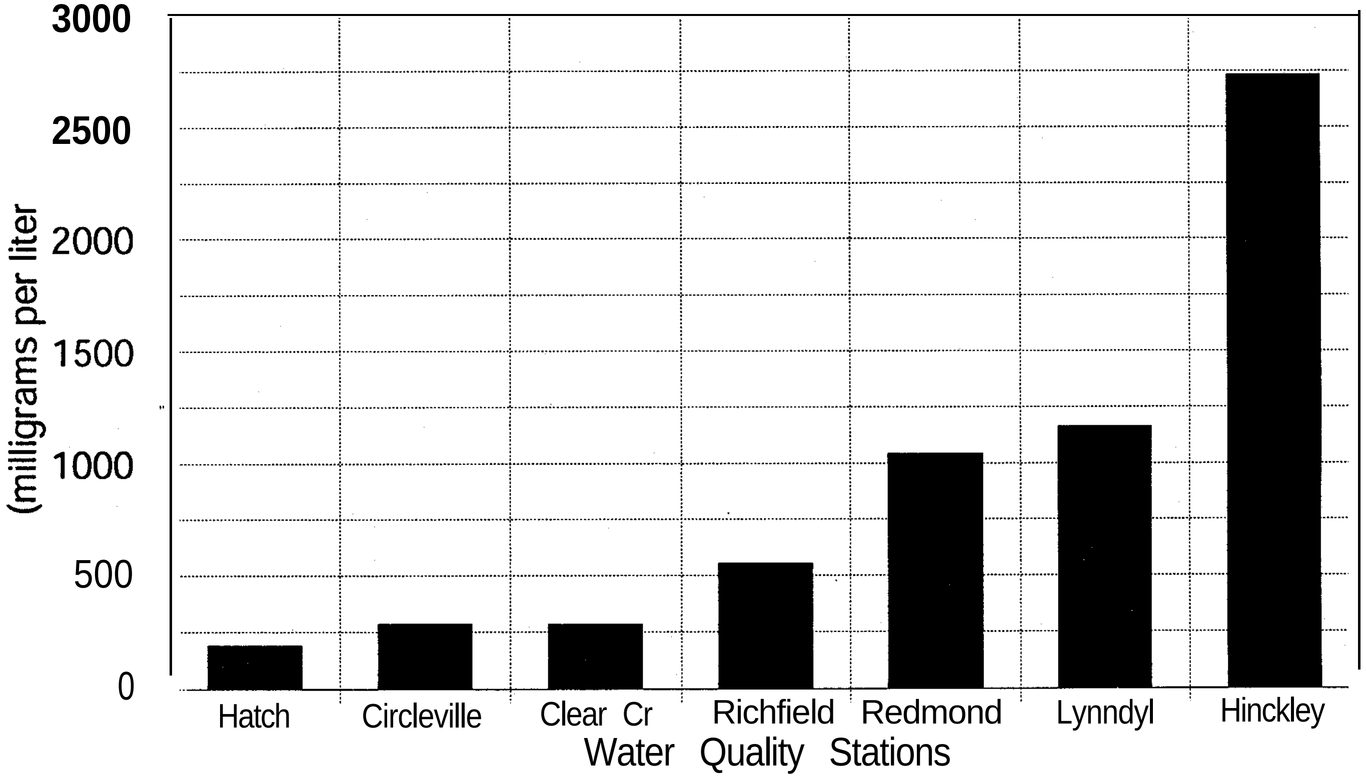
Groundwater recharge areas consist of both consolidated rock and alluvium. These areas are critical to water quality as the salts leached from them determine the constituents contaminating the groundwater. In potential recharge areas where the aquifer is exposed, it can be contaminated by precipitation and pollutants left in or on the land that are leached into the groundwater. High quality alluvial aquifers are especially vulnerable to pollution by the activities of people.

Individual septic tanks are ineffectively managed at the present time. Although construction according to local health department specifications is required, there is not much control over individual operation and many septic tanks fail over time. With increasing growth in rural areas, use of septic tanks is increasing. This

Figure 12-7

**WATER QUALITY**

Sevier River



is compounding the problem of existing concentrations of septic tanks, such as in the Monroe area or in the Duck Creek-Swain Creek area on the upper Asay Creek drainage. There have been few advances to customize septic tank design to the hydro geologic setting or aquifer type. It is now a "one-size-fits-all" approach.

The groundwater quality varies throughout the basin. Like surface water, the groundwater quality is highest in the upper reaches along the Sevier River and its tributaries and decreases downstream. The same is true in each individual groundwater reservoir where the water quality decreases in a downstream direction.

The total dissolved-solids concentrations (specific conductance)were sampled in **Panguitch Valley** during 1988-89 in the valley-fill aquifers.[60] Wells sampled ranged from 159 mg/L (270 µS/cm) to 443 mg/L (750 µS/cm) with an average of 293 mg/L (497 µS/cm). Spring samples were 242 mg/L (410 µS/cm) to 425 mg/L (720 µS/cm) with an average of 317 mg/L ( 538 µS/cm). Mammoth Spring was 100 mg/L (170 µS/cm).

Groundwater quality seemed to be better in the **East Fork of the Sevier River.**[60] The one well tested was 226 mg/L (383 µS/cm) in the East Fork of the Sevier River. The wells in Grass Valley averaged 153 mg/L (260 µS/cm).

Circleville Spring in **the Circle Valley** subbasin showed 86 mg/L TDS.[39] Water from one well about 2 miles northeast of Circleville was 473 mg/L TDS. A well north of Marysvale has calcium and chloride as the predominate ions with TDS of 1,955 mg/L (3,310 µS/cm). In general, the groundwater in the Junction-Marysvale subbasin is of good quality with less than 295 mg/L (500 µS/cm).

Groundwater in the Sevier-Sigurd portion of **the Sevier Valley** subbasin was measured by specific conductance methods.[39] From these measurements, the total dissolved-solids (TDS) in the Joseph area along the Sevier River were 342 mg/L (580 µS/cm). They were about 428 mg/L (725 µS/cm) about 2 miles northwest of Monroe. Downstream to about 2-1/2 miles SSE of Richfield, groundwater quality ranged from 218 mg/L (370 µS/cm) to 437 mg/L (740 µS/cm). In the area east of Richfield, groundwater quality was 861 to 2,148 mg/L (1,460 to 3,640 µS/cm). Wells in the Vet-million area showed 251 to 885 mg/L (425 to 1,500 µS/cm). Data from the Sigurd area indicated values ranged from 466 to 702 mg/L (790 to 1,190 µS/cm). As can be seen, the groundwater quality varies from area to area but declines in a downstream direction. Water tends to be of higher quality away from the Sevier River.

The north portion of the Sevier Valley subbasin in the Aurora-Salina area north to Gunnison has water with TDS about twice that in the Sevier-Sigurd portion. In the Aurora-Salina area, values range from 590 mg/L (1,000 µS/cm) to 1 ,180 mg/L (2,000 µS/cm).

**Sanpete Valley** groundwater total dissolved-solids (TDS) range from about 500-600 mg/L in the Fairview-Mt. Pleasant area to over 1,000 mg/L below Chester and toward Gunnison Reservoir.[76] The Fountain Green-Moroni area groundwater is in the 500-700 mg/L range although Big Springs is 245 mg/L. Nitrate concentrations are a problem in some areas. See Section 19.2.6 for more information.

The **southern Juab Valley** groundwater around Levan flows from the mouths of Chicken and Pigeon creeks to Chicken Creek Reservoir[59] (Juab Lake). The TDS in the groundwater was 623 mg/L at a well about one mile north of Levan and 3,180 mg/L in a spring at the northeast end of Chicken Creek Reservoir.

The **Sevier Desert** contains two aquifers, one shallow (less than 500 feet below the land surface) and one deep (over 800 feet below the land surface). The water quality was about 200 mg/L TDS in the Lynndyl-Delta area in the deep aquifer.[26] In the southwestern part of the area toward Sevier Lake, dissolved- solids exceed 10,000 mg/L in the shallow aquifer.

Dissolved-solids in **Pahvant Valley** range from 300 mg/L to over 6,000 mg/L.[36] Water in the eastern part of the valley have dissolved-solids less than 1,000 mg/L while the rest of the valley ranges from 1,000 to 5,000 mg/L although some areas west of Kanosh are over 6,000 mg/L. More information can be found in Section 19, Groundwater.

## 12.5 ALTERNATIVE WATER QUALITY IMPROVEMENTS

Navajo Lake, Otter Creek Reservoir and Panguitch Lake are being studied under the Clean Lakes Program. These water bodies exhibit problems and these studies will determine how best to improve the water quality.

The water quality problem in Navajo Lake is caused by macrophytes or aquatic plants growing in the lake.[37] When this biological community overpopulates as it has in Navajo Lake, it interferes with the lake habitat and recreational uses. A Clean Lakes Phase I Program is being conducted to determine possible solutions. The study will cost $60,000.

Otter Creek Reservoir and Panguitch Lake water quality problems are caused by eutrophication.[37] This natural aging process is characterized by increased nutrient concentrations and sedimentation rates. These water bodies are being studied under Clean Lakes Program, Phase I grants of nearly $50,000 for Panguitch Lake and $100,000 for Otter Creek Reservoir.

As of 1997, the Otter Creek Watershed has received $375,000 of Clean Water Act, Section 3 19 Nonpoint Source Program funds. These funds have been and will continue to be used to implement best management practices (BMPs) which will improve water quality within the watershed. The types of BMPs installed in the watershed include, rangeland treatment, irrigation improvement, riparian enhancement and stream bank stabilization. Division of Water Quality monitoring activities within the Otter Creek watershed include chemical, physical and biological monitoring. These monitoring programs will document water quality before and after implementation of BMP's.

Some correctional measures have been implemented in the Panguitch Lake watershed under the Clean Lakes Program, Phase II . These are intended to control agricultural waste from grazing livestock and recreational waste and litter from getting into the lake.

Landfill locations can be controlled by elected officials and government agencies working together. They should be located in areas where surface water or groundwater will not become contaminated through leaching or runoff. Agricultural BMPs and good land management practices, in the valley croplands and the upper watersheds, will help control nonpoint pollution. Also, controls on construction and other land surface disturbances will reduce pollution.

Over-irrigation is contributing to pollution by leaching chemicals out of the soil and into the groundwater reservoirs. Technology is available to reduce this type of pollution. The use of pesticides is also suspected to contribute to the problem. Better control would help reduce pollution from this source.

In some areas, grazing or other causes have depleted the land cover and the riparian vegetation. Efforts to reestablish range and riparian vegetation will reduce erosion and the resulting pollution. See watershed inventories and restoration in Section 10.

Some time in the future, sewage treatment plants may become an alternative in the larger communities. Treatment of waste water and releasing it back into the system could increase the available water supply where the current method of using sewage lagoons, evaporates most of the water into the atmosphere. Funds could be made available through the Water Quality Board's revolving loan fund and from grants available from other sources.

The Division of Water Quality is conducting a water quality study in the Sevier River Basin. This study should update current data and discuss alternatives for water quality improvements.